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NOTES ON ARIZONA RODENTS.

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In continuance of her plan to build up at the University of California a representative collection of the mammals inhabiting the southwestern United States, Miss Annie M. Alexander recently deposited in the Museum of Vertebrate Zoology more than one thousand specimens personally collected and prepared by herself and Miss Louise Kellogg in 1933. Included in the part of this material so far prepared for study are specimens which, together with specimens already present in the Museum of Vertebrate Zoology and in some other collections, constitute a basis for adding to the existing store of knowledge concerning the speciation and distribution of four genera of rodents.

One of the rodent species, the pocket gopher from northwestern Arizona, was recognized as a new geographic race from the study of specimens taken by Miss Alexander and Miss Kellogg in 1932. In the summer of 1933, they, with Dr. and Mrs. Benson, returned to the locality and on this visit additional specimens were obtained which permit of more satisfactory diagnosis of the new subspecies. The new race may be named and described as follows:

Thomomys bottae trumbullensis, new subspecies.

Type.—Male, adult, skin-and-skull; no. 58588, Mus. Vert. Zool.; three miles south of Nixon Spring, Mt. Trumbull, Mohave Co., Arizona; May 26, 1933; collected by Seth B. Benson, original no. 2005.

Distribution.—Northwestern Arizona and extreme southwestern Utah, from the Colorado River north to the Virgin River, west of Kanab Wash.

Diagnosis.—A *Thomomys* of the *bottae* group. Resembles *T. b. planirostris* Burt in size (see measurements), but coloration (attaining summer pelage) much darker. General ground color near Cinnamon Buff, but

upper parts tinged with black; fore and hind feet and distal one-third to one-half of tail pinkish white; black post-auricular patches distinct. Skull: Similar in shape to that of *planirostris*; lambdoidal and parietal ridges well developed; zygomata wide-spreading, slightly wider anteriorly than posteriorly; dorsal profile of skull in longitudinal axis shows very little convexity; dorsal face of rostrum near junction of nasals and frontals usually transversely flat or slightly concave, rather than convex; bullae well inflated and anteriorly truncate; paroccipital processes well developed.

Comparisons.—As compared with *Thomomys bottae planirostris* Burt [two topotypes and Burt's (1931, p. 39) measurements available], *T. b. trumbullensis* averages smaller in total length, length of tail and length of hind foot; color much darker in dorsal aspect; skull approximately same size, but less convex dorsally in longitudinal axis; bullae more inflated; palatal pits deeper; alveolar length of maxillary tooth row less; rostrum less depressed distally and extensions of premaxillae posterior to nasals one-third shorter. Differs from *T. b. absonus* Goldman (eighteen topotypes available) in darker coloration dorsally; larger and heavier skull; palatal pits deeper; rostrum relatively broader, longer and distally less depressed; zygomata heavier and actually, though not relatively, broader; parietal and paroccipital processes much more developed.

Remarks.—As judged by cranial characters, *Thomomys bottae trumbullensis* is closely related to *T. b. planirostris* Burt. In color, however, *trumbullensis* is considerably darker. Three specimens from six miles north of Wolf Hole, Mohave County, Arizona, which are somewhat lighter in color and are too young to present sufficient diagnostic cranial characters, are, for the present, referred to *trumbullensis*. Two females from the south side of the Virgin River, St. George, Washington County, Utah, are intermediates. They show characters of each of the four geographically adjacent races, *T. b. centralis* Hall, *T. b. planirostris* Burt, *T. b. absonus* Goldman and *T. b. trumbullensis*, though on the basis of size and five out of eight cranial characters they are referable to *trumbullensis*. These, and two specimens from just north of the Virgin River at St. George which have characters of *centralis*, *planirostris* and *trumbullensis*, but which are referable to *centralis*, would tend to show that in the vicinity of St. George the four above mentioned races merge and blend almost imperceptibly with one another.

Two specimens from the head of Toroweap Valley, Mohave County, Arizona, tend toward *trumbullensis* in three out of five cranial characters, but approach *absonus* in the other two cranial characters and in color. Though clearly intergrades, they here are referred to *trumbullensis*. Seven specimens from near Kanab Wash at the southern boundary of the Kaibab Indian Reservation, and one specimen from Kanab, Kane County, Utah, though not typical *absonus* are referred to that race rather than to *trumbullensis*. Much of Mount Trumbull is of volcanic origin and dark colored. Perhaps the dark color of the pocket gophers there indicates a response to their environment. At any rate, each of the 25 specimens examined from Nixon Spring, and points within 4 miles thereof, are darker colored than individuals of nearby geographic races, and four of the specimens have

jet black pelage everywhere save on the feet and distal third of the tail. These parts are white.

Measurements.—Average and extreme measurements of 13 adult males and 8 adult females of *T. b. trumbullensis*, excluding the specimens from Utah and those from the head of Toroweap Valley and six miles north of Wolf Hole, are as follows: Total length, ♂ 227 (251–201), ♀ 200 (216–182); length of tail, 70 (82–58), 61 (69–54); length of hind foot, 28 (31–25), 27 (29–23); basilar length, 34.3 (37.7–30.0); 30.7 (32.5–29.0); length of rostrum, 16.9 (18.8–14.0), 14.5 (15.1–13.8); length of nasals, 13.6 (15.8–11.0), 11.7 (12.6–10.5); zygomatic breadth, 24.6 (26.7–21.2), 21.8 (22.8–21.0); mastoid breadth, 20.2 (21.5–18.4), 18.5 (19.6–17.6); interorbital breadth, 6.5 (6.8–6.3), 6.5 (6.8–6.2); maxillary tooth row, 7.8 (8.8–7.2), 7.3 (8.0–6.8); breadth of rostrum, 8.2 (9.5–7.0), 7.2 (7.6–6.8); extension of premaxillae posteriorly to nasals, 2.4 (3.0–1.8), 2.5 (3.6–1.5).

Specimens examined.—Total number, 31, as follows: From Mohave County, Arizona: Nixon Spring, 6250 ft., Mt. Trumbull, 8; three miles south of Nixon Spring (volcanic sand), Mt. Trumbull (type locality), 3; four miles south of Nixon Spring (volcanic sand), Mt. Trumbull, 13; head of Toroweap Valley, 2; six miles north of Wolf Hole, 4900 ft., 3; south side Virgin River, St. George, Washington County, Utah, 2.

Sigmodon hispidus cienegae A. B. Howell. Cotton Rat.—Two adult males, nos. 50857–8, from Fort (Camp) Grant, 5200 ft., Graham County, Arizona, indicate intergradation between *Sigmodon hispidus confinis* Goldman, as known to us by ten topotypes, and *Sigmodon hispidus cienegae* of which three topotypes and thirteen other specimens from Continental, Arizona, are available for comparison. Near approach to *confinis* is shown in the short (13.4 and 14.7 mm.) nasals. The basilar length and zygomatic breadth are exactly intermediate as between *confinis* and *cienegae*. The other parts of the skull measured are more like those of *cienegae*. The same is true of color. The external measurements are even larger than in *cienegae*. In adult males of comparable age, the hind foot is found to average 38 (36–39) mm. in the animals from Fort Grant, 35 (35–36) in four *cienegae* from Continental, and 31 (31–31) in three topotypes of *confinis*. The teeth of the Fort Grant males are smaller than those of *cienegae*. Even so, the size of the cheek teeth is nearer to that in *cienegae* than it is to that in *confinis* which has much smaller teeth. It is interesting that these two males from Fort Grant were trapped at the same place where an adult female *Sigmodon minimus minimus* Mearns was taken. The latter was taken in a trap set beneath mesquite bushes one-half mile south of the military buildings at Fort Grant now used as an industrial school. The two male *hispidus* were taken the following day in traps set in a thick patch of sunflowers in an area alongside the school garden where Miss Alexander found cuttings of bunch grass among the sunflowers and squash vines.

Two specimens from Pinery Canyon, Chiricahua Mountains, Cochise County, are referable to *cienegae* rather than to *confinis* on the basis of large hind foot (35 mm. dry) and size of skull and teeth which, as in the

Fort Grant specimens, resemble corresponding parts of *confinis*, but show nearer approach to *cienegae*. The color is darker than in the Fort Grant specimens and about as in *cienegae*.

Other specimens recorded from this general part of Arizona, and probably referable to *cienegae*, are 12 from Fairbank (Allen, 1895, p. 220) and 3 from 7 miles north of Patagonia (Swarth, 1929, p. 363).

Three young specimens from Peterson Ranch, 6100 ft., Huachuca Mountains, Cochise County, Arizona, one from head of Miller Canyon, 8400 ft., in the same mountains, and one young from four miles northwest of San Luis Pass, 5200 ft., Animas Valley, Hidalgo County, New Mexico, provide new record stations of occurrence. These five young specimens agree in having the nose and a ring around the eye cinnamon colored. Although traces of this same color have been detected in young topotypes of *Sigmodon hispidus arizonae*, in *S. h. cienegae* from Continental, Arizona, and in the two adults from Fort Grant, Arizona, the cinnamon color in these young specimens from the Huachuca Mountains and Animas Valley is so intense and extensive as to suggest the existence there of a variant uniformly characterized by this coloration. This coloration does not appear among ten young and adult topotypes of *S. h. confinis* nor in two specimens of *S. h. berlandieri* from two miles north of Canadian, Hemphill County, Texas. Unfortunately, the specimens in question are so young as not to show cranial characters of systematic worth in comparison with the geographically adjacent subspecies now known. For the present we tentatively refer these young specimens to *Sigmodon hispidus cienegae*.

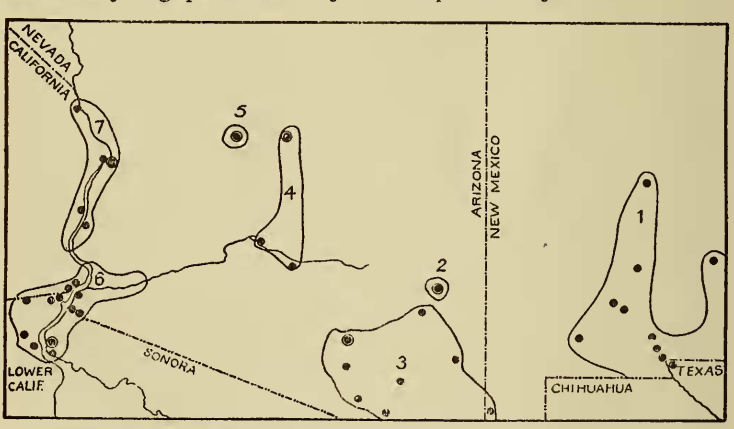

Fig. 1. Map showing the distribution of *Sigmodon hispidus* in California, Lower California, Arizona and parts of Sonora and New Mexico. 1. *Sigmodon hispidus berlandieri* Baird. 2. *S. h. confinis* Goldman. 3. *S. h. cienegae* A. B. Howell. 4. *S. h. arizonae* Mearns. 5. *S. h. jacksoni* Goldman. 6. *S. h. eremicus* Mearns. 7. *S. h. plenus* Goldman.

As basis for the accompanying distributional map, we have employed, n addition to the specimens above mentioned, those recorded by Bailey

(1931, p. 167), Goldman (1928, p. 206), Grinnell (1914, p. 230) and Mearns (1907, p. 453), three in the collection of the California Institute of Technology from Laveen, Arizona, and specimens in the Museum of Vertebrate Zoology from localities as follows: Sacaton, Arizona, and from Lower California, Mexico: Colorado River, 20 mi. S. Pilot Knob; Alamo River, 50 ft., 20 mi. S. Pilot Knob; Colorado River, Lat. 32° 15′; 5 mi. E. Cerro Prieto, 30 ft.; 9 mi. E. Cerro Prieto, 30 ft.; Imperial Canal, 11 mi. E. Mexicali, one-half mile south of the International Boundary, near Allison Heading.

Clethrionomys limitis (Bailey), Red-backed Vole.—Twelve specimens from Hannagan Meadow, 9500 to 9600 feet, and ten from Hannagan Creek, 8600 feet, all in Greenlee County, Arizona, were trapped beneath logs in the fir and pine forest, save in one instance where the animal was taken on a moss-covered stone beneath alders. With six topotypes of *C. limitis* taken in late October, 1906, for comparison, our specimens are seen constantly to differ, at all ages, in having the posterior border of the hard palate straight rather than provided with a median posterior projection. Comparing six of our specimens, comparable in age, with the six not fully adult topotypes, it develops that, on the average, the Arizona-taken animals have narrower teeth and a rostrum which, relative to its length, is narrower. Also, the palatal breadth, as measured between the second upper molars, is wider. In the Arizona specimens the breadth of the palate, on the average, amounts to 88 per cent of the width of the rostrum as opposed to only 79 per cent in the topotypes of *C. limitis*. Indeed, among the 12 specimens of similar age that were measured, only one instance of overlap in these percentages occurs. Finally, comparing specimens judged by cranial characters to be of the same age, the Arizona animals are smaller; the total length is only 125.6 millimeters as against 134.0 and length of tail 30.4 as against 36.8.

The topotypes are in winter pelage, whereas our specimens taken in July and late September are in summer pelage. The marked seasonal difference in coloration prevents our judging of geographic color variation if such exists.

Although several of the above mentioned differences, for example the trenchant differences in construction of the palate, may constitute adequate basis for subspecific separation of the Arizona animals, we refer them to *C. limitis* at least until opportunity permits us to make comparison with additional specimens from the general range of *C. limitis*.

Zapus luteus luteus Miller, Jumping Mouse.—The taking of two specimens at 8200 feet elevation on Hannagan Creek, one at 8600 feet elevation on Hannagan Creek, Greenlee County, Arizona, and eight at 7700 feet on the west fork of Black River, Apache County, Arizona, marks a notable extension of recorded geographic range to the westward for this form which is thought not to have been reported before from the State of Arizona. All were taken under, or in openings among, alders along the stream where the vegetation, other than alder, was relatively sparse.

With two adult, female, topotypes (nos. 133602–03, U. S. Nat. Mus.) of *Z. luteus* available for comparison no differences judged to be of systematic worth can be detected in our specimens. They answer, precisely, to Miller's original description (1911, p. 253) of the species. How *Zapus luteus australis* Bailey differs from *Z. l. luteus* or from our specimens is not known. Average and extreme measurements of ten adults from Greenlee County, Arizona, are as follows: Total length, 209 (197–220); length of tail, 128 (120–138); length of hind foot, 30.6 (29–32); occipito-nasal length, 23.6 (22.8–24.3); zygomatic breadth, 11.5 (11.0–11.9); least interorbital breadth, 4.5 (4.3–4.9); mastoid breadth, 10.5 (9.9–11.0); height of skull above a plane touching tips of incisors and inferior margins of tympanic bullae, 9.2 (9.0–9.6); crown length of upper molar-premolar tooth-row, 3.8 (3.6–4.0); length of palate, 3.3 (3.0–3.7).

Literature Cited.

Allen, J. A. 1895. On a collection of mammals from Arizona and Mexico, made by Mr. W. W. Price, with field notes by the collector. Bull. Am. Mus. Nat. Hist., **7**: 193–258. 5 figs. June 29, 1895.

Bailey, V. 1931. Mammals of New Mexico. U. S. Dept. Agr. Bur. Biol. Surv., N. Am. Fauna, no. 53: 1–412, 22 pls., 57 figs. December, 1931.

Burt, W. H. 1931. A new pocket gopher of the genus Thomomys from Utah. Proc. Biol. Soc. Wash., **44**: 37–40. May 8, 1931.

Goldman, E. A. 1928. Three new rodents from western Arizona. Proc. Biol. Soc. Wash., **41** : 203–206. December 18, 1928.

Grinnell, J. 1914. An account of the mammals and birds of the lower Colorado Valley. Univ. Calif. Publ. Zool., **12** (no. 4) : 51–294, 11 pls., 9 figs. March 20, 1914.

Mearns, E. A. 1907. Mammals of the Mexican Boundary of the United States . . . Bull. U. S. Nat. Mus., **56** (part 1) : I–XV+1–530, 2 pls., 126 figs. 1907.

Miller, G. S., Jr. 1911. A new jumping-mouse from New Mexico. Proc. Biol. Soc. Wash., **24** : 253–254. December 23, 1911.

Swarth, H. S. 1929. The faunal areas of southern Arizona: a study in animal distribution. Proc. Calif. Acad. Sci., **18** (no. 12) : 267–383, 6 pls., 7 figs. April 26, 1929.